PATENT ABSTRACTS OF JAPAN

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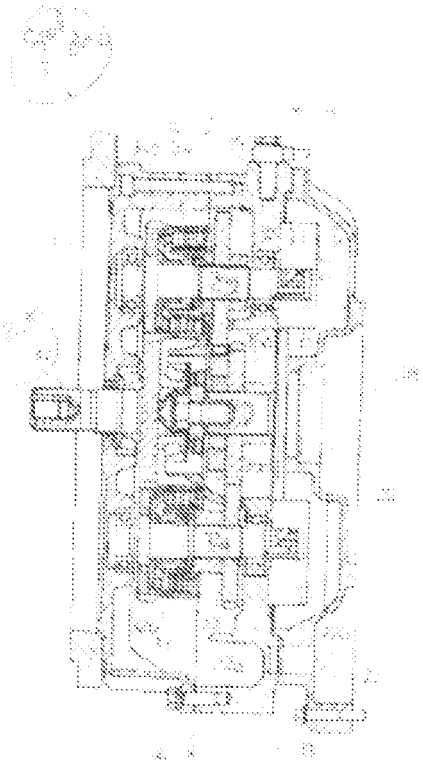
(54) SPEED CHANGE MECHANISM AND SPEED CHANGE CONTROLLING METHOD FOR MARINE PROPELLING APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a speed change mechanism capable of miniaturizing and also obtaining free speed change ratios in a marine propelling apparatus having a prime mover, a marine gear and speed change gear.

SOLUTION: In the marine propelling apparatus having the prime mover 1, the marine gear 20 and the speed change gear 3, the marine gear 20 is provided with a forward and reverse clutch, and the speed change gear 3 is arranged between the prime mover 1 and the forward and reverse clutch. A clutch shaft mechanism is arranged in an outer periphery of an input shaft 37 to the speed change gear 3, and arranged numbers of the clutch shaft mechanism are more than numbers of speed change. The aforementioned clutch shaft mechanism having the same speed change ratio is disposed to the position of a point of symmetry or the position closer to the point of symmetry against the aforementioned input shaft 37.



* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the speed change structure and the control method of a ship propulsive engine.
[0002]
[Description of the Prior Art]In the former, there are drawing 23, the gearbox 70 which comprises an epicyclic gear drive as shown in drawing 24, and a one-way clutch, the gearbox 80 provided with the parallel train of gears which established one axis per [as shown in drawing 27 from drawing 25] 1 gear change, etc. as a gearbox which constitutes a ship propulsive engine. When multi stage gear change was obtained, only the number of ** ratios constituted the gearbox using the clutch shaft mechanism, and the clutch shaft mechanism was established for every order **.
[0003]
[Problem(s) to be Solved by the Invention]Since the epicyclic gear drive 71 is used for said gearbox 70 and it is governed by the engagement conditions in an internal tooth, a sun gear, and an epicyclic gear, a free gear ratio cannot obtain it easily. For this reason, a velocity ratio low the flexibility of a velocity ratio and possible as the 2nd speed will be limited. There is no restriction of a velocity ratio with the gearbox 80. However, in the gearbox 80, driving force is transmitted by the output-shaft side via one axis which supports pivotably the 1st speed gear 83 or the 2nd speed gear 85. For this reason, all the burdens in the case of transmitting driving force will start this one axis. In addition, in the gearbox 80, since an output side is the composition of one axis to 1 gear change, radial road R occurs. If radial road R occurs, load will be applied to a bearing and the increase of mechanical loss and a bearing life will become short. When multi stage gear change was realized, since the number of allocation of the clutch shaft mechanism of only a number of speeds was needed, by the former, the number of allocation of the clutch shaft mechanism was increasing. For this reason, the gearbox style itself was made to enlarge.
[0004]

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CLAIMS

[Claim(s)]
[Claim 1]Are a ship propulsive engine provided with a motor, slowdown reversing gear, and a gearbox, and these slowdown reversing gear are provided with an order ** clutch, Speed change structure of a ship propulsive engine having formed this gearbox between this motor and a this order ** clutch, and this gearbox's having provided a clutch shaft mechanism in a periphery of an input shaft of this gearbox, and making the number of allocation of this clutch shaft mechanism more than a number of speeds of this gearbox.
[Claim 2]receiving said input shaft, when said two or more clutch shaft mechanisms are made into the same change gear ratio -- a point symmetry position -- or speed change structure of the ship propulsive engine according to claim 1 having arranged in a position near point symmetry
[Claim 3]Speed change structure of a ship propulsive engine which is a ship propulsive engine provided with a motor, slowdown reversing gear, and a gearbox, and is characterized by providing these slowdown reversing gear with an advance 2nd speed type clutch, and forming at least one gearbox between this motor and this advance 2nd speed type clutch.
[Claim 4]Speed change structure of a ship propulsive engine which is a ship propulsive engine provided with a gearbox and slowdown reversing gear, and is characterized by establishing a lubricating oil passage in a mating face of this gearbox and these slowdown reversing gear.
[Claim 5]Speed change structure of the ship propulsive engine according to claim 1 providing a one-way clutch on said clutch shaft mechanism or said input shaft.
[Claim 6]Speed change structure of a ship propulsive engine which is a ship propulsive engine provided with a gearbox and slowdown reversing gear, and is characterized by making an output shaft of this gearbox incline to an input shaft of this gearbox.
[Claim 7]Are a ship propulsive engine provided with a gearbox, and this gearbox is carrying out the inner package of the 2nd speed type clutch, A hydraulic circuit of this gearbox comprises a hydraulic pump, a sequence valve, and a solenoid operated directional control valve, Shall switch a ** ratio by this solenoid operated directional control valve, and pressure oil is supplied to a hydraulic clutch by the

side of the 1st speed through this sequence valve from this hydraulic pump at the time of the 1st speed, At the time of the 2nd speed, supply pressure oil to a hydraulic clutch by the side of the 2nd speed through this solenoid operated directional control valve from this hydraulic pump, and. Speed change structure of a ship propulsive engine carrying out the drain of the hydraulic oil which applied pilot pressure power to this sequence valve, and switched this sequence valve, and with which a hydraulic clutch by the side of the 1st speed was filled up through this sequence valve.

[Claim 8]A speed change control method of a ship propulsive engine being a ship propulsive engine provided with a gearbox and slowdown reversing gear, once controlling clutch oil pressure of this gearbox to low pressure, performing clutch insertion of these slowdown reversing gear between them, and making clutch oil pressure of this gearbox into total pressure after that.

[Claim 9]A hydraulic clutch by which is a ship propulsive engine provided with a motor, a gearbox, and slowdown reversing gear, and an inner package is carried out to this gearbox, Or slide a file plate of a hydraulic clutch by which an inner package is carried out to both this gearbox and these slowdown reversing gear, enable low-speed NAV and sliding of this file plate, A speed change control method of a ship propulsive engine making it generate by control of the number of drive revolutions of this motor and either of these clutch oil pressure, or both sides.

[Translation done.]

[Means for Solving the Problem]The issue which is going to solve this invention is like the above, and a means for next solving this SUBJECT is explained. Namely, it is a ship propulsive engine provided with a motor, slowdown reversing gear, and a gearbox in Claim 1, These slowdown reversing gear are provided with an order ** clutch, this gearbox is formed between this motor and a this order ** clutch, this gearbox provides a clutch shaft mechanism in a periphery of an input shaft of this gearbox, and the number of allocation of this clutch shaft mechanism is made more than a number of speeds of this gearbox.

[0005]receiving said input shaft in Claim 2, when said two or more clutch shaft mechanisms are made into the same change gear ratio -- a point symmetry position -- or it arranges in a position near point symmetry.

[0006]In Claim 3, it is a ship propulsive engine provided with a motor, slowdown reversing gear, and a gearbox, and these slowdown reversing gear are provided with an advance 2nd speed type clutch, and form and constitute at least one gearbox between this motor and this advance 2nd speed type clutch.

[0007]In Claim 4, it is a ship propulsive engine provided with a gearbox and slowdown reversing gear, and a lubricating oil passage is established in a mating face of this gearbox and these slowdown reversing gear.

[0008]In Claim 5, a one-way clutch is provided on said clutch shaft mechanism or said input shaft.

[0009]It is a ship propulsive engine provided with a gearbox and slowdown reversing gear, and an output shaft of this gearbox is made to incline to an input shaft of this gearbox in Claim 6.

[0010]In Claim 7, are a ship propulsive engine provided with a gearbox, and this gearbox is carrying out the inner package of the 2nd speed type clutch, A hydraulic circuit of this gearbox comprises a hydraulic pump, a sequence valve, and a solenoid operated directional control valve, Shall switch a ** ratio by this solenoid operated directional control valve, and pressure oil is supplied to a hydraulic clutch by the side of the 1st speed through this sequence valve from this pump at the time of the 1st speed, Pressure oil is supplied to a hydraulic clutch by the side of the 2nd speed through this solenoid operated directional control valve from this hydraulic pump, and pilot pressure power is applied to this sequence valve at the time of the 2nd speed, it switches this sequence valve, and is made to carry out the drain of the hydraulic oil with which the 1st speed side was filled up through this sequence valve.

[0011]In Claim 8, it is a ship propulsive engine provided with a gearbox and slowdown reversing gear, and clutch oil pressure of this gearbox is once controlled to low pressure, and clutch insertion of these slowdown reversing gear is performed between them, and let clutch oil pressure of this gearbox be total pressure after that.

[0012]It is a ship propulsive engine provided with a motor, a gearbox, and slowdown reversing gear in Claim 9. Slide a file plate of a hydraulic clutch by which an inner package is carried out to both a hydraulic clutch by which an inner package is carried out to this gearbox or this gearbox, and these slowdown reversing gear, enable low-speed NAV and sliding of this file plate, it is made to generate by control of the number of drive revolutions of this motor and either of these clutch oil pressure, or both sides.

[0013]

[Embodiment of the Invention]Next, working example of this invention is described. Drawing 1 is a side view of the marine vessel in which the gearbox layout for marine gears is shown, Drawing 2 is a side view of the marine vessel in which the gearbox layout for drive devices is shown, Drawing 3 is a drive skeleton figure of the gearbox of the first working example, and drawing 4 is a clutch shaft mechanism layout pattern of the input-shaft periphery in the gearbox of the first working example, Drawing 5 is a sectional view of the gearbox of the first working example, and drawing 6 is an A-A sectional view of the gearbox of the first working example in which the gear arrangement seen from the motor side is shown, Drawing 7 is a B-B sectional view of the gearbox of the first working example seen from the slowdown reversing-gear side, Drawing 8 is a clutch shaft mechanism layout pattern of the input-shaft periphery in the gearbox of the second working example, Drawing 9 is a clutch shaft mechanism layout pattern of the input-shaft periphery in the gearbox of the first working example showing signs that a radial road is applied, Drawing 10 is a layout pattern of the parallel train of gears of a marine gear, and drawing 11 is a clutch shaft mechanism layout pattern of the input-shaft periphery of the gearbox of the third working example, Drawing 12 is a drive skeleton figure of the gearbox of the fourth working example, drawing 13 is a drive skeleton figure of the gearbox of the fifth working example, drawing 14 is a drive skeleton figure of the gearbox of the sixth working example, and drawing 15 is a drive skeleton figure of the gearbox of the seventh working example, Drawing 16 is a side view of the marine vessel in which the propulsive engine layout for ships of the seventh working example is shown, Drawing 17 is a hydraulic-circuit figure of the gearbox in which the feeding-pressure-oil state at the time of the 1st speed is shown, Drawing 18 is a hydraulic-circuit figure of the gearbox in which the feeding-pressure-oil state at the time of the 2nd speed is shown, Drawing 19 is a figure showing the temporal change of the size of an insertion shock, and drawing 20 is a procedure figure showing the speed change control method of the first working example, Drawing 21 is a mimetic diagram showing the situation of gear change by the speed change control method of the second working example, Drawing 22 is a mimetic diagram showing the situation of gear change by the speed change control method of the third working example, Drawing 23 is a skeleton figure of the conventional gearbox which comprises an epicyclic gear and a one-way clutch, Drawing 24 is a layout pattern of the gear sequence of the conventional gearbox which comprises an epicyclic gear and a one-way clutch, Drawing 25 is a skeleton figure of the conventional gearbox which comprises a parallel train of gears, drawing 26 is a layout pattern of the gear sequence of the conventional gearbox which comprises a parallel train of gears, and drawing 27 is a layout pattern of the gear sequence of the conventional gearbox in which signs that a radial road is applied are shown.

[0014]The propulsive engine for ships is provided with the marine gear 20 and the gearbox 3 which are the motor 1 and slowdown reversing gear in the speed change structure of the first working example. The marine gear 20 is provided with the order ** clutch, and the gearbox 3 is formed between the motor 1 and the this order ** clutch. The gearbox 3 forms the 1st speed clutch shaft mechanisms 32 and 32 and the 2nd speed clutch shaft mechanisms 34 and 34 in the periphery of the input shaft 37,

and makes the number of allocation of those clutch shaft mechanisms more than the number of speeds of this gearbox 3. It is good also as the drive device 21 instead of the marine gear 20.
[0015]The arranging position of the gearbox 3 is explained first. Drawing 1 shows the case where the interior of a ship is equipped with the marine gear 20, as slowdown reversing gear, and drawing 2 shows the case where it has the drive device 21 overboard, as slowdown reversing gear. The marine gear 20 and the drive device 21 which are slowdown reversing gear are all provided with the order "* clutch, and are enabling the change of order "*. And the gearbox 3 is allocated between the motor 1 and these slowdown reversing gear, even when it has the marine gear 20 and which slowdown reversing gear of the drive device 21. For this reason, the gearbox 3 is located between the motor 1 and said order ** clutch. It has composition which carries out the inner package of the gearbox 3 to slowdown reversing gear, and may be made to allocate the gearbox 3 between these motor 1 and slowdown reversing-gear order *" clutches.
[0016]Therefore, the driving force of the motor 1 is transmitted to the marine gear 20 (drive device 21) through the gearbox 3, and rotates the propeller 4 via the propeller shaft 11 which extends from this marine gear 20 (drive device 21).
[0017]In the former, there is the gearbox 70 which comprises an epicyclic gear drive and a one-way clutch, or the gearbox 80 provided with the parallel train of gears which established one axis per 1 gear change as said gearbox.
[0018]The gearbox 70 is a thing provided with the epicyclic gear drive 71, as shown in drawing 23 and drawing 24 -- two or more epicyclic gears 73 and 73 -- the input shaft 75 is fixed to the internal gear 74 which attaches ... outside, the supporter 76 -- the epicyclic gears 73 and 73 ... is supported enabling free rotation and the output shaft 72 is fixed to this supporter 76. The sun gear 77 is constituted by connecting and disconnecting of the clutch 78 so that rotational immobilization and release are possible. The input shaft 75 and the output shaft 72 are connected via the one-way clutch 79.
[0019]Above, when the clutch 78 is made "OFF" by composition, it becomes the 1st speed. That is, driving force is transmitted via the one-way clutch 79, and the input shaft 75 and the output shaft 72 rotate at the same number of rotations. Since it will become [that it can rotate freely and] if immobilization of the sun gear 77 is canceled, the epicyclic gear drive 71 does not serve as resistance of transmitting power. That is, the epicyclic gears 73 and 73 supported pivotably by the internal gear 74 and the supporter 76 with rotation of the input shaft 75 at this time -- it is for ... to rotate in one. It becomes the 2nd speed when the clutch 78 is connected. namely, the epicyclic gears 73 and 73 supported pivotably by the supporter 76 with rotation of the input shaft 75 since the sun gear 77 was being fixed ... rotates with revolution of the circumference of the sun gear 77. And these epicyclic gears 73 and 73 ... The internal gear 74 is also rotated with rotation. At this time, the number of rotations of the internal gear 74 is larger than the number of rotations of the supporter 76, therefore the number of rotations of the output shaft 72 increases rather than the number of rotations of the input shaft 75. In the case of the 2nd speed with larger number of rotations of the output shaft 72 than the number of rotations of the input shaft 75, since the one-way clutch 79 is made into "OFF", rotation of different

number of rotations on the same axle is added, and this output shaft 72 is not twisted.
[0020]Since the gearbox 70 is governed by the engagement conditions of the epicyclic gear drive 71, a free gear ratio cannot obtain it easily. For this reason, a velocity ratio low the flexibility of a velocity ratio and possible as the 2nd speed will be limited.
[0021]As shown in drawing 25 and drawing 26, the gearbox 80 constituted the parallel train of gears, and is provided with one axis per 1 gear change. In the case of the 1st speed clutch shaft mechanism 82, in the case of the clutch shaft 82a and the 2nd speed clutch shaft mechanism 84, each axis is the clutch shaft 84a. The input shaft 90 fixes the input gear 81, and this input gear 81 has geared with the input gear 82b of the 1st speed clutch shaft mechanism 82. The 1st speed clutch shaft mechanism 82 is installing the clutch shaft 82a, and is enabling the connecting-and-disconnecting change of this clutch shaft 82a and the input gear 82b. The clutch shaft 82a fixes the 1st speed gear 83, and this 1st speed gear 83 has geared with the output gear 86a fixed to the output shaft 91. Said input gear 81 has geared also with the input gear 84b of the 2nd speed clutch shaft mechanism 84. The 2nd speed clutch shaft mechanism 84 is installing the clutch shaft 84a, and is enabling the connecting-and-disconnecting change of this clutch shaft 84a and the input gear 84b. The clutch shaft 84a fixes the 2nd speed gear 85, and this 2nd speed gear 85 has geared with the output gear 86b fixed to the output shaft 91. The output gear 86a is a gear of a major diameter from the output gear 86b. The 2nd speed gear 85 is a gear of a major diameter from the 1st speed gear 83.
[0022]It becomes the 1st speed, when the 1st speed clutch shaft mechanism 82 is connected and the 2nd speed clutch shaft mechanism 84 is made "OFF" above by composition. On the contrary, it becomes the 2nd speed, when the 1st speed clutch shaft mechanism 82 is made into "OFF" and the 2nd speed clutch shaft mechanism 84 is connected.
[0023]said gearbox 70 -- the output-shaft 72 side -- two or more epicyclic gears 73 and 73 -- driving force is transmitted via ... Therefore, the burden per [which supports each epicyclic gear 73 pivotably] axis is small, and ends. On the other hand, with the gearbox 80, driving force is transmitted by the output-shaft side via one axis of the clutch shaft 82a which fixes the 1st speed gear 83, or the clutch shaft 84b which fixes the 2nd speed gear 85. For this reason, the burden in the case of transmitting driving force will start this one axis. Therefore, in the gearbox 80, said each clutch shaft mechanism will become large, and the gearbox itself will be enlarged.
[0024]Next, the structure of the gearbox 3 is explained. In the gearbox 3, the problem of said conventional gearbox 70, i.e., the lowness of the flexibility of a velocity ratio, the problem of said conventional gearbox 80, and enlargement of each clutch shaft mechanism are improved.
[0025]The gearbox 3 constitutes the parallel train of gears like said gearbox 80, as shown in drawing 3 and drawing 4. That is, the input shaft 37 fixes the input gear 31, and this input gear 31 has geared with the input gear 32b of the 1st speed clutch shaft mechanism 32. The clutch shaft 32a is inserted, the hydraulic clutch 132 is infixed between this clutch shaft 32a and the input gear 32b, and the 1st speed clutch shaft mechanism 32 is enabling the connecting-and-disconnecting change. The clutch shaft 32a fixes the 1st speed gear 33, and this 1st speed gear 33 has geared with the output gear 36a

fixed to the output shaft 38. Said input gear 31 has geared also with the input gear 84b of the 2nd speed clutch shaft mechanism 34. The clutch shaft 34a is inserted, the hydraulic clutch 134 is infixed between this clutch shaft 34a and the input gear 34b, and the 2nd speed clutch shaft mechanism 34 is enabling the connecting-and-disconnecting change. The clutch shaft 34a fixes the 2nd speed gear 35, and this 2nd speed gear 35 has geared with the output gear 36b fixed to the output shaft 38. The output gear 36a is used as the gear of a major diameter from the output gear 36b, and is using the 2nd speed gear 35 as the gear of a major diameter from the 1st speed gear 33.

[0026]Unlike said conventional gearbox 80, with the gearbox 3, it has provided biaxial per 1 gear change. Each axis is said clutch shafts 32a and 32a and said clutch shafts 34a and 34a. As shown in drawing 4, the 1st speed clutch shaft mechanism 32 and the two 2nd speed clutch shaft mechanisms 34 are allocated by each periphery of the input shaft 37, respectively. That is, there is more allocation of a clutch shaft mechanism than a number of speeds (the first working example two pieces) (the first working example four pieces).

[0027]The free velocity ratio is made easy to obtain by establishing a parallel train of gears first by the above composition unlike said conventional gearbox 70. Since the number of allocation of the clutch shaft mechanism is made more than a number of speeds, unlike said conventional gearbox 80, the burden of the transmitting driving force per each clutch shaft mechanism is eased, and the size of this clutch shaft mechanism can be made small. Therefore, the size of the gearbox 3 whole is miniaturizable.

[0028]The concrete figure of the gearbox 3 in the first working example is shown in drawing 5 - drawing 7. On the periphery of the input shaft 37, the hydraulic pump 39 other than said clutch shaft mechanisms 32 and 34 is allocated. In drawing 5, a left is the motor 1 side, and the right direction is the marine gear 20 side. The 1st speed and the 2nd speed are defined sequentially from the accelerating side. Also about the 3rd speed and the 4th speed which are mentioned later, it is the same and a change gear ratio increases in order of the 1st speed, the 2nd speed, the 3rd speed, and the 4th speed.

[0029]It replaces with said gearbox 3 and the gearbox structure of the second working example using the gearbox 5 is explained. Although it had provided biaxial per all the 1 gear changes with the gearbox 3, the point that only the 1st speed provides biaxial and has established only one axis per 1 gear change in other gear changes is different with the gearbox 5. With the gearbox 5, as shown in drawing 8, the 1st speed clutch shaft mechanisms 32 and 32, the 2nd speed clutch shaft mechanism 34, and the 3rd speed clutch shaft mechanism 40 are formed in the periphery of the input shaft 37 to this gearbox 5, and the number of allocation of those clutch shaft mechanisms is made more than a number of speeds. About the 1st speed, the same effect as the above-mentioned gearbox 3 is acquired, and the size of the whole gearbox can be miniaturized.

[0030]In said conventional gearbox 80 using a parallel train of gears, as shown in drawing 27, radial road R occurs. Radial road R is load which the mutual gear which has geared generates in response to repulsive force in the case of the transmitting driving force through a gear. In drawing 27, generating of

radial road R at the time of the 1st speed by the side of the output shaft 91 is illustrated. In the output-shaft 91 side, radial road R occurs by engagement of the 1st speed gear 83 and the output gear 86a. A radial road generates the input-shaft 90 side similarly between the input gear 81 and the input gear 82b of the 1st speed clutch shaft mechanism 82. If radial road R occurs, load will be applied to a bearing and the increase of mechanical loss and a bearing life will become short.

[0031]For this reason, in the gearbox 3 in the speed change structure of the first working example, said 1st speed clutch shaft mechanisms 32 and 32 and the 2nd speed clutch shaft mechanisms 34 and 34 which are the same change gear ratios are arranged in the position near point symmetry to said input shaft 37. Since the gearbox 3 has provided biaxial to 1 gear change unlike said conventional gearbox 80 having established only one axis to 1 gear change, such arrangement is enabled.

[0032]Since the hydraulic pump 39 is arranged on input-shaft 37 periphery as the gearbox 3 shows to drawing 6, said clutch shaft mechanisms 32 and 34 are arranged in the position shifted from the perfect point symmetry position. The arranging position of the hydraulic pump 39 may be changed and a clutch shaft mechanism may be arranged in a point symmetry position.

[0033]As shown in drawing 4 and drawing 9, radial road R can be offset by arranging the 1st speed clutch shaft mechanisms 32 and 32 and the 2nd speed clutch shaft mechanisms 34 and 34 in a point symmetry position. In this case, since radial road R works in the direction of point symmetry mutually, it denies and suits, offsetting a part of radial road R, even when arranging the clutch shaft mechanism of the same change gear ratio in the position near point symmetry, as shown in drawing 6 -- the influence -- **** -- things are made.

[0034]Above, by composition, the great portion of radial road the great portion of [a part or] denies and suits, and load of a bearing is made small. For this reason, mechanical loss decreases and it leads to extension of the life of a bearing.

[0035]When multi stage gear change was obtained in the former, only the number of ** ratios allocated the clutch shaft mechanism in the input-shaft periphery, and constituted the parallel train of gears. This is because only one was provided but the gearbox tended to obtain multi stage gear change only by one gear change. For this reason, the clutch shaft mechanism is independently needed for every order **, and the number of allocation of the clutch shaft mechanism needed so much was made to increase. Therefore, the gearbox itself was made to enlarge.

[0036]For this reason, in the speed change structure of the first working example, the gearbox 3 is formed between the motor 1 and the marine gear 20 which is slowdown reversing gear which carry out the inner package of the advance 2nd speed type clutch. The marine gear 20 is provided with the order ** clutch as mentioned above, as stated [especially] here, it is an advance 2nd speed type, and it is enabling the change of the advance 1st speed and the advance 2nd speed. That is, since it is made to change gears with two gearboxes of the gearbox 3 and the marine gear 20, the number of allocation of a clutch shaft mechanism can be lessened to the number of the ** ratios obtained. If it is the gearbox 6 mentioned later, said gearbox 5, and the other gearboxes which perform two or more steps of gear changes instead of using the gearbox 3, the speed change structure of said ship propulsive engine

may be constituted using which. It is good also as composition which allocates two or more gearboxes of gearbox 3 grade between the motor 1 and the marine gear 20. The drive device 21 which carries out the inner package of the advance 2nd speed type clutch may be used instead of the marine gear 20.
[0037]As shown in drawing 1, since the driving force from the motor 1 receives two gear changes by the gearbox 3 and the marine gear 20, it can obtain the change gear ratio of number-of-speeds (two steps) x2 of the gearbox 3.
[0038]The marine gear 20 which is an example of said slowdown reversing gear is explained. As shown in drawing 10, the marine gear 20 comprises the backward clutch axis structure 24 allocated on the input shaft 23, and the 1st speed clutch shaft mechanism 25 and the 2nd speed clutch shaft mechanism 26 which are allocated by this input-shaft periphery.
[0039]The input shaft 23 fixes the input gear 23a, and has geared with the 1st speed gear 25a and the 2nd speed gear 26a. In the 1st speed side, the 1st speed clutch shaft mechanism 25 is inserting the clutch shaft 25b, and the 1st speed gear 25a is fixed to this clutch shaft 25b. The output gear 25c is formed on the same axle of the clutch shaft 25b, and the 1st speed clutch shaft mechanism 25 is enabling the connecting-and-disconnecting change of this clutch shaft 25b and this output gear 25c via the clutch. The 2nd speed clutch shaft mechanism 26 has formed the 2nd speed gear 26a, the clutch shaft 26b, and the output gear 26c, and the 2nd speed side is also the same structure as the 1st speed side. They are enabled for the output gears 25c and 26c to have geared with the output gear 27 fixed to the output shaft 28, and to carry out transmitting driving force of them from the input shaft 23 to the 1st speed and 2nd speed side, and to output gear change from this output shaft 28 as the 1st speed and the 2nd speed by composition, above.
[0040]The input shaft 23 is inserted in the backward clutch axis structure 24. The backward clutch axis structure 24 is allocating the sternway gear 29 on the same axle of the input shaft 23, and is enabling the connecting-and-disconnecting change of this input shaft 23 and the sternway gear 29 via the clutch. The sternway gear 29 and the output gear 27 have got into gear, and make it possible to transmit above the driving force reversed from the input shaft 23 to the output shaft 28 by composition.
[0041]It is the 1st speed, when making the backward clutch axis structure 24 and the 2nd speed clutch shaft mechanism 26 into "OFF" and connecting the 1st speed clutch shaft mechanism 25. Similarly, it will become the 2nd speed if the connecting-and-disconnecting state of the 1st speed clutch shaft mechanism 25 and the 2nd speed clutch shaft mechanism 26 is replaced. The hand of cut of the gear in the case of the 1st speed and the 2nd speed is direction of the arrow shown with a dashed line in drawing 10. In sternway, the backward clutch axis structure 24 is connected, and it makes "OFF" the 1st speed clutch shaft mechanism 25 and the 2nd speed clutch shaft mechanism 26. The hand of cut of the gear in sternway is direction of the arrow shown as a solid line in drawing 10.
[0042]By composition, the marine gear 20 is enabling the gear change change with advance 2 gear change and sternway above. Therefore, the marine vessel can obtain a number of speeds twice the change gear ratio of said gearbox 3 grade at the time of advance.
[0043]The gearbox 6 may be used in order to obtain a multi stage change gear ratio more. In the

speed change structure of the third working example, it replaces with the gearbox 3 and the gearbox 5 is used. The gearbox 5 has formed the 1st speed clutch shaft mechanism 32, the 2nd speed clutch shaft mechanism 34, the 3rd speed clutch shaft mechanism 40, and the 4th speed clutch shaft mechanism 41 in the periphery of the input shaft 37, as shown in drawing 11. By composition, the "" ratio from the 1st speed to the 4th speed can be obtained above. For this reason, in the speed change structure of the third working example, since four steps of gear ratios are acquired with the gearbox 5 and two steps of advance and one step of sternway are acquired by the marine gear 20, the change gear ratio of eight steps of advance and four steps of sternway can be obtained according to the whole speed change structure.

[0044]Said gearbox 3 has established the lubricating oil passage 22 in the mating face of this gearbox 3 and said marine gear 20.

[0045]As shown in drawing 7 from drawing 5, the oilway 22a is drilled by the casing of the gearbox 3, and the oilway 22b is drilled by the casing of the marine gear 20. When the gearbox 3 and the marine gear 20 are doubled, the oilways 22a and 22b are formed so that it may be open for free passage, double the oilways 22a and 22b, and constitute the lubricating oil passage 22.

[0046]By composition, a lubricating oil is above sharable between the marine gear 20 and the gearbox 3. And since there is also no necessity of adding parts, such as exclusive parts and a hose, and supply of a lubricating oil can be performed, it leads to reduction of part mark, or a cost fall.

[0047]Conventionally, the clutch shaft mechanism allocated in a gearbox or slowdown reversing gear was constituted using the hydraulic clutch. If one clutch shaft mechanism is connected applying oil pressure simultaneously at the time of gear change and the clutch shaft mechanism of another side is made into "OFF", different torque will be transmitted and a shock will be produced from the axis from which a "" ratio differs on an input shaft and an output shaft. Time not to deliver power that it applies oil pressure by a time lag occurs, output rotation declines, and a shock is produced. In order to prevent these shocks, it is necessary to control mutual oil pressure well. When using a hydraulic clutch difficult [control], part mark increase so much.

[0048]For this reason, in the speed change structure of the fourth working example, it replaces with the gearbox 3 and the gearbox 7 is used. In the gearbox 7, the one-way clutch 43 is formed on the 1st speed clutch shaft mechanism 42. The clutch shaft mechanism which allocates a one-way clutch may not be limited to the 1st speed clutch shaft mechanism 42, but may be on other clutch shaft mechanisms. In the gearbox 8 and the gearbox 9, the one-way clutch is allocated on the input shaft 37. It replaces with the gearbox 3, respectively and the speed change structure in the sixth working example using the speed change structure and the gearbox 9 of the fifth working example using the gearbox 8 is also explained below.

[0049]As the gearbox 7 is shown in drawing 12, it is the almost same composition as said gearbox 3, and only the 1st speed clutch shaft structure Mino clutch mechanism is different. In the gearbox 3, connecting and disconnecting of the clutch shaft 32a inserted in the 1st speed clutch shaft mechanism 32 is performed by the hydraulic clutch. On the other hand, in the gearbox 7, connecting and

disconnecting of the clutch shaft 42a inserted in the 1st speed clutch shaft mechanism 42 is performed by the one-way clutch 43. Connecting and disconnecting of the clutch shaft 42a and the input gear 42b also of the 1st speed clutch shaft mechanism 42 is enabled like the 1st speed clutch shaft mechanism 32.

[0050]By composition, a shock does not arise above at the time of the gear change change to the 1st speed from the 2nd speed and the 2nd speed from the 1st speed. Although the connection of the hydraulic clutch 134 by which the inner package is carried out to the clutch shaft mechanism 34 is started at the time of the gear change change to the 2nd speed from the 1st speed, confrontation of different torque is avoided with said one-way clutch 43. That is, with the one-way clutch 43, the drive revolution of the 2nd speed by the clutch shaft 42a is made into "OFF", and is not transmitted to the input-shaft 37 side. For this reason, the drive revolution of the 2nd speed does not produce torsion between the drive revolutions of the 1st speed. Transfer of the drive revolution from which it differs with the one-way clutch 43 similarly at the time of the gear change change to the 1st speed from the 2nd speed is made into "OFF", and confrontation of torque is avoided.

[0051]As shown in drawing 13, the gearbox 8 is a 2nd speed-type gearbox and is allocating the 2nd speed clutch shaft mechanism 34 in input-shaft 37 periphery. The output gear 36b is fixed to the output shaft 38, and this output gear 36b and the input shaft 37 are connected via the one-way clutch 43. This is a transmitting-driving-force course in case the gearbox 8 gives the change gear ratio of the 1st speed. The input shaft 37 fixes said input gear 31, and this input gear 31 has geared with said input gear 34b. Said 2nd speed gear 35 and the output gear 36b have got into gear, and via the 2nd speed clutch shaft mechanism 34, to the output shaft 38, constitute driving force from the input shaft 37 so that transfer is possible. This is a transmitting-driving-force course in case the gearbox 8 gives the change gear ratio of the 2nd speed.

[0052]By composition, rotation of the output gear 36b idles to the input shaft 37 with the one-way clutch 43 at the time of a mutual gear change change with the 1st speed and the 2nd speed above. For this reason, confrontation of torque is avoided like said gearbox 7.

[0053]The gearbox 9 has added the 3rd speed clutch shaft mechanism 40 which gives the change gear ratio of the 3rd speed to the gearbox 8, as shown in drawing 14. In the mutual gear change change with the 1st speed and the 2nd speed, and the mutual gear change change with the 1st speed and the 3rd speed, confrontation of torque is avoided by the same mechanism as said gearbox 8.

[0054]Said output shaft 38 is made to incline to said input shaft 37, and the gearbox 10 consists of speed change structures of the seventh working example. The point of difference with the speed change structure of the first working example is a point of replacing with the gearbox 3 and using the gearbox 10.

[0055]The gearbox 10 allocates and constitutes the 1st speed clutch shaft mechanisms 32 and 32 and the 2nd speed clutch shaft mechanisms 34 and 34 on input-shaft 37 periphery like said gearbox 3 grade, as shown in drawing 15. A greatly different point from the gearbox 3 is constituting the output gears 46a and 46b fixed to the output shaft 38 from a bevel gear instead of a spur wheel. The output

gear 46a has geared with the 1st speed gear 33 fixed to said clutch shaft 32a, and is enabling the output of the 1st speed. The output gear 46b has geared with the 2nd speed gear 35 fixed to said clutch shaft 34a, and is enabling the output of the change gear ratio of the 2nd speed.

[0056]An angle can be given to the propeller shaft 11 when installing the motor 1 horizontally by composition, even if it uses the marine gear [being parallel (an output shaft is parallel arrangement)] 20 above. As shown in drawing 16, when allocating the gearbox 10 and the parallel marine gear 20 in a marine vessel, the extending direction of said propeller shaft 11 inclines to the extending direction (the installation direction of the motor 1) of the output shaft of the motor 1.

[0057]Conventionally, the solenoid operated directional control valve is used for the switching control of the feeding pressure oil of a hydraulic clutch by which an inner package is carried out to a gearbox. The oil pressure descent at the time of a gear change change is prevented by this control. Therefore, in the case of the gearbox provided with two or more hydraulic clutches, it has the solenoid operated directional control valve to each hydraulic clutch, and the control technique which switches these two or more solenoid operated directional control valves was needed.

[0058]For this reason, as shown in drawing 17, the hydraulic circuit 50 of said gearbox 3 shall be constituted from the hydraulic pump 39, the sequence valve 51, and the solenoid operated directional control valve 52, and the "" ratio shall be switched by this solenoid operated directional control valve 52. Pressure oil is supplied to the hydraulic clutch 44 by the side of the 1st speed through this sequence valve 51 from this hydraulic pump 39 at the time of the 1st speed. At the time of the 2nd speed, supply pressure oil to the hydraulic clutch 44 by the side of the 2nd speed through this solenoid operated directional control valve 52 from this hydraulic pump 39, and. Pilot pressure power is applied to this sequence valve 51, this sequence valve 51 is switched, and it is made to carry out the drain of the hydraulic oil with which the hydraulic clutch 44 by the side of the 1st speed was filled up through this sequence valve 51. It is good also as composition which replaced this, and the above-mentioned 1st speed and the 2nd speed are changed from what mentioned above the definition of the 1st speed and the 2nd speed, and are better also as an accelerating side in the 2nd speed than as the 1st speed. If it is a gearbox which carries out the inner package of the 2nd speed-type hydraulic clutch, it will not be limited to the gearbox 3.

[0059]As mentioned above, the 1st speed clutch shaft mechanisms 32 and 32 and the 2nd speed clutch shaft mechanisms 34 and 34 are allocated by the gearbox 3. And on those clutch shaft mechanisms, the hydraulic clutch 44 is allocated, respectively. To the hydraulic clutch 44 by the side of the 1st speed, feeding pressure oil is made more possible via the oilway 55 from said hydraulic pump 39 than via the sequence valve 51. To the hydraulic clutch 44 by the side of the 2nd speed, feeding pressure oil is made more possible via the oilway 53 from this hydraulic pump 39 than via the solenoid operated directional control valve 52.

[0060]When a change gear ratio is the 1st speed, pressure oil is supplied to the hydraulic clutch 44 by the side of the 1st speed via the sequence valve 51 from said hydraulic pump 39. Supply of the pressure oil by the side of the 2nd speed stops by the switching control of the solenoid operated

directional control valve 52. The controller is allocated by the marine vessel. this controller is connected with the solenoid operated directional control valve 52, and switching control of this solenoid operated directional control valve 51 is made possible.

[0061]When making a change gear ratio into the 2nd speed, said solenoid operated directional control valve 52 is switched, and pressure oil is supplied to the hydraulic clutch 44 by the side of the 2nd speed. Branching is provided in the oilway 53 from the solenoid operated directional control valve 52 to the hydraulic clutch 44 by the side of the 2nd speed, and supply of pressure oil is enabled also at the sequence valve 51. That is, when switching control to the 2nd speed of the solenoid operated directional control valve 52 is performed, pressure oil (pilot pressure power) is supplied to the sequence valve 51 and the oil pressure in the oilway 53 goes up beyond constant value, The energizing force of the energization spring 51a with which the sequence valve 51 is equipped is resisted, and this sequence valve 51 is switched. If the change of the sequence valve 51 takes place, as shown in drawing 18, the feeding pressure oil from the hydraulic pump 39 to the first gear side will stop. In addition, the drain of the hydraulic oil with which the hydraulic clutch 44 by the side of first gear was filled up is carried out via the sequence valve 51.

[0062]When considering it as the 1st speed again, the solenoid operated directional control valve 51 is switched, and the feeding pressure oil from the hydraulic pump 39 to the 2nd speed side is suspended. The drain of the hydraulic oil with which the hydraulic clutch 44 by the side of the 2nd speed was filled up, and the pilot pressure power to the sequence valve 51 is carried out via the oilway 53 by this change. And the sequence valve 52 is switched along with the fall of pilot pressure power, and the hydraulic circuit 50 shifts to the state in which feeding pressure oil is possible again to the 1st speed side as shown in drawing 17.

[0063]The ** ratio changeover section 54 is equipped with said sequence valve 51, and this ** ratio changeover section 54 is attached to the gearbox 3, as shown in drawing 6 and drawing 7.

[0064]the above -- composition -- the solenoid operated directional control valve 52 -- a sequence valve can be interlocked by one change and mechanical structure can constitute a gear change mechanism. Therefore, in the stage where the oil pressure to one hydraulic clutch 44 is maintained at the half clutch state, the feeding pressure oil to the hydraulic clutch to another side could be performed, and the shock due to the rapid oil pressure fall at the time of gear change is prevented.

[0065]An insertion shock was generated, when connecting between output shafts by said slowdown reversing gear and making transmitting driving force possible conventionally. The input shaft of these slowdown reversing gear has inputted the output from the gearbox of a ship propulsive engine, and is made to drive by connection of clutch mechanical application. With this clutch mechanical application, when inserting the input joint to an output shaft in this input shaft, an insertion shock occurs. Drawing 19 (a) - (b) shows the temporal change of the size of the insertion shock at the time of this insertion. P shows the temporal change of hydraulic oil axis end pressure, and T shows the temporal change of clutch output shaft torque. The hydraulic oil axis end pressure P is the oil pressure of the hydraulic clutch by which an inner package is carried out to this gearbox here. Clutch output shaft torque T is the

torque by the side of the output shaft of this hydraulic clutch. The output shaft of this hydraulic clutch is connected with the input shaft of these slowdown reversing gear via this gearbox, and receives change in the size of torque by said inserlion shock. t0 shows the start time of said insertion.

[0066]When performing said insertion, with oil pressure (it is considered as total pressure) maintained when said hydraulic clutch connected certainly, as shown in drawing 19 (b), an insertion shock occurs. Compared with clutch output shaft torque T slable periodically after fixed time lapse, clutch output shaft torque T immediately after the start time t0 is going up to one 4 to 5 times the size of this.

[0067]for this reason -- once controlling the clutch oil pressure of the gearbox 3 by the speed change control method of the first working example to low pressure, and connecting the output shaft of the marine gear 20 which is slowdown reversing gear (13) and in the meanlime -- (14) -- in (15) and the above, the speed change control method 12 consists of procedures by making this clutch oil pressure into total pressure after that. If it is a gearbox which engaged and disengaged driving force with a hydraulic clutch, it will noi be limted to the gearbox 3, and if it is slowdown reversing gear provided with clutch mechanical application, it will not be limited to the marine gear 20.

[0068]According to Procedure 13, the hydraulic oil axis end pressure P is first controlled to low pressure to be shown in drawing 19 (a) and drawing 20. And said controller and an electromagnetism flow rate valve are connected, and said clutch oil pressure is made controllable by regulalion of the hydraulic oil flow to said hydraulic clutch 44. As for each hydraulic clutch 44, the oil pressure control shall be performed by this electromagnetism flow rate valve. The oil pressure made into low pressure with the above is determined by an input torque and clutch capacity. Subsequenily, according to Procedure 14, while this low-pressure control is performed, said insertion is performed, and connection of said input shaft 37 and said outpui shaft 38 is performed. Since connection of said hydraulic clutch 44 is loose compared with the time of said lotal pressure at this lime, an insertion shock hardly occurs The size of clutch output shaft torque T immediately after said start time t0 is a size without clutch output shaft torque T stable periodically after fixed time lapse, and an almost change. Compared with an insertion shock as shown in drawing 19 (b), it is reduced greatly. After this insertion is completed, let hydraulic oil axis end pressure P be lotal pressure according to Procedure 15 that it should return to the clutch oil pressure at the time of connection

[0069]With constituting the above speed change control methods 12, the insertion shock at the lime of connecting the output shaft of slowdown reversing gear is reduced.

[0070]Conventionally, a troll (low-speed NAV) was not made in the marine gear which does not have a hydraulic clutch, and the marine vessel provided with the drive device.

[0071]For this reason, hydraulic clutches 44 and 44 by which an inner package is carried out to the gearbox 3 in the speed change control meihod of ihe second working example . . A file plate is slid and low-speed NAV is enabled. And about sliding of this file plate, they are the number of drive revolutions and these hydraulic clutches 44 and 44 of the motor 1. . Control either of the clutch oil pressure, or both sides, it is made to generale, and the speed change control method is constituted. As long as it is the gearbox whose connecting and disconnecting of driving force is enabled with the hydraulic clutch, it

may replace with the gearbox 3 and other gearboxes may be used. It is good also as the drive device 21 instead of the marine gear 20.

[0072]As shown in drawing 3, the inner package of the hydraulic clutch 44 is carried out to each clutch shaft mechanism by which the inner package is carried out to said gearbox 3, respectively. And these hydraulic clutches 132 and 134 ... Conirol which changes the number of drive revolutions of the output shaft of said motor 1 or the clutch oil pressure of these hydraulic clutches 132 and 134, and lets a file plate slide is performed. it mentioned above -- as -- the gearbox 3 -- each clutch shaft structure -- the hydraulic clutches 132 and 134 are allocated splendidly -- a total of four hydraulic clutches 132 and 134 -- it has ... It lets these slide simultaneously and the drive revolution of low rotation is transmitted to an output side. Said controller is connected to said electromagnetism flow rate valve, and they are said hydraulic clutches 132 and 134... This clutch oil pressure is made controllable by regulation of the hydraulic oil flow.

[0073]That is, as shown in drawing 23, the drive revolution from the motor 1 receives the low-speed gear change by clutch sliding with the gearbox 3 first. And it slows down by the marine gear 20 which is slowdown reversing gear, and the drive revolution made the low speed by two gear changes is transmitted to the propeller shaft 11.

[0074]Also in the mechanical marine gear and drive device which do not have a hydraulic clutch, composition can perform a troll above. Since the drive revolution which turned into low rotation by said control is inputted into this marine gear and this drive device, lives by which the inner package is carried out, such as a clutch part of a bearing and this marine gear, are prolonged.

[0075]In the speed change control method of the third working example, low-speed gear change is performed also using the hydraulic clutch by which an inner package is carried out to slowdown reversing gear in addition to the speed change control method of the second working example. namely, the hydraulic clutches 132 and 134 of the gearbox 3 -- the file plate of both hydraulic clutch by which an inner package is carried out to ... and slowdown reversing gear is slid, and low-speed NAV is enabled. And the number of drive revolutions of the motor 1 and either of these clutch oil pressure, or both sides are controlled, sliding of this file plate is generated, and the speed change conirol method is constituted.

[0076]That is, as shown in drawing 24, the drive revolution from the motor 1 receives the low-speed gear change by clutch sliding with the gearbox 3 first. And the marine gear 20 which is slowdown reversing gear receives further a slowdown and the low-speed gear change by clutch sliding Therefore, the drive revolution made the low speed by three gear changes is transmitted to the propeller shaft 11

[0077]

[Effect of the Invention]It is the ship propulsive engine provided with like, a motor, slowdown reversing gear, and a gearbox according to claim 1, These slowdown reversing gear are provided with the order ** clutch, and this gearbox is formed between this motor and a this order ** clutch, The free velocity ratio is made easy to constitute a parallel train of gears and to obtain, since this gearbox provided the

clutch shaft mechanism in the periphery of the input shaft of this gearbox and the number of allocation of this clutch shaft mechanism was made more than the number of speeds of this gearbox. The burden of the transmitting driving force per each clutch shaft mechanism is eased, and the size of this clutch shaft mechanism can be made small. Therefore, the size of the whole gearbox is miniaturizable.

[0078]receiving said input shaft, when [according to claim 2] like and said two or more clutch shaft mechanisms are made into the same change gear ratio -- a point symmetry position -- or since it has arranged in the position near point symmetry, it denies, and the great portion of radial road the great portion of [a part or] suits, it is offset, and it makes load of a bearing small. For this reason, mechanical loss decreases and it leads to extension of a bearing life.

[0079]Are the ship propulsive engine provided with like, a motor, slowdown reversing gear, and a gearbox according to claim 3, and these slowdown reversing gear are provided with the advance 2nd speed type clutch, and between this motor and this advance 2nd speed type clutch, Since at least one gearbox was formed and constituted, the change gear ratio of more multistage than the number of clutch shaft mechanism allocation can be obtained. Multi stage gear change can be obtained without being able to obtain the change gear ratio of number-of-speeds x2 of a gearbox, and enlarging the whole gearbox, in combining slowdown reversing gear and a gearbox provided with the 2nd speed clutch.

[0080]It is a ship propulsive engine provided with a gearbox and slowdown reversing gear, and since the lubricating oil passage was established in the mating face of this gearbox and these slowdown reversing gear, a lubricating oil is sharable between these principle reversing gear and a gearbox. And since there is also no necessity of adding parts, such as exclusive parts and a hose, and supply of a lubricating oil can be performed, it leads to reduction of part mark, or a cost fall.

[0081]The thing [that a shock arises at the time of a gear change change since the one-way clutch was provided on like, said clutch shaft mechanism, or said input shaft] according to claim 5 cannot be found.

[0082]Since it is the ship propulsive engine provided with like, a gearbox, and slowdown reversing gear according to claim 6 and the output shaft of this gearbox was made to incline to the input shaft of this gearbox, An angle can be given to the propeller shaft 11 when installing the motor 1 horizontally, even if it uses the marine gear [being parallel (an output shaft is parallel arrangement)] 20.

[0083]Are the ship propulsive engine provided with like and a gearbox according to claim 7, and this gearbox is carrying out the inner package of the 2nd speed type clutch, The hydraulic circuit of this gearbox comprises a hydraulic pump, a sequence valve, and a solenoid operated directional control valve. Shall switch a "" ratio by this solenoid operated directional control valve, and pressure oil is supplied to the hydraulic clutch by the side of the 1st speed through this sequence valve from this pump at the time of the 1st speed, At the time of the 2nd speed, supply pressure oil to the hydraulic clutch by the side of the 2nd speed through this solenoid operated directional control valve from this hydraulic pump, and, Since it was made to carry out the drain of the hydraulic oil which applied pilot pressure power to this sequence valve, and switched this sequence valve and with which the 1st

speed side was filled up through this sequence valve, A sequence valve can be interlocked by the change of this one solenoid operated directional control valve, and mechanical structure can constitute a gear change mechanism. Therefore, in the stage where the oil pressure to one hydraulic clutch is maintained at the half clutch state, the feeding pressure oil to the hydraulic clutch to another side could be performed, and the shock due to the rapid oil pressure fall at the time of gear change is prevented.

[0084]Since are the ship propulsive engine provided with like, a gearbox, and slowdown reversing gear according to claim 8, the clutch oil pressure of this gearbox is once controlled to low pressure, clutch insertion of these slowdown reversing gear is performed between them and clutch oil pressure of this gearbox is made into total pressure after that, an insertion shock is mitigable.

[0085]It is the ship propulsive engine provided with like, a motor, a gearbox, and slowdown reversing gear according to claim 9, Slide the file plate of the hydraulic clutch by which an inner package is carried out to both the hydraulic clutch by which an inner package is carried out to this gearbox or this gearbox, and these slowdown reversing gear, enable low-speed NAV and sliding of this file plate, Since it is made to generate by control of the number of drive revolutions of this motor and either of these clutch oil pressure, or both sides, a troll can be performed also in the mechanical marine gear and drive device which do not have a hydraulic clutch. Since the drive revolution which turned into low rotation by said control is inputted into this marine gear and this drive device, lives by which the inner package is carried out, such as a clutch part of a bearing and this marine gear, are prolonged.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The side view of the marine vessel in which the gearbox layout for marine gears is shown.
[Drawing 2]The side view of the marine vessel in which the gearbox layout for drive devices is shown.
[Drawing 3]The drive skeleton figure of the gearbox of the first working example.
[Drawing 4]The clutch shaft mechanism layout pattern of the input-shaft periphery in the gearbox of the first working example.
[Drawing 5]The sectional view of the gearbox of the first working example.
[Drawing 6]The A-A sectional view of the gearbox of the first working example in which the gear arrangement seen from the motor side is shown.
[Drawing 7]The B-B sectional view of the gearbox of the first working example seen from the slowdown reversing-gear side.
[Drawing 8]The clutch shaft mechanism layout pattern of the input-shaft periphery in the gearbox of the second working example.
[Drawing 9]The clutch shaft mechanism layout pattern of the input-shaft periphery in the gearbox of the first working example showing signs that a radial road is applied.
[Drawing 10]The layout pattern of the parallel train of gears of a marine gear.
[Drawing 11]The clutch shaft mechanism layout pattern of the input-shaft periphery of the gearbox of the third working example.
[Drawing 12]The drive skeleton figure of the gearbox of the fourth working example.
[Drawing 13]The drive skeleton figure of the gearbox of the fifth working example.
[Drawing 14]The drive skeleton figure of the gearbox of the sixth working example.
[Drawing 15]The drive skeleton figure of the gearbox of the seventh working example.
[Drawing 16]The side view of the marine vessel in which the propulsive engine layout for ships of the seventh working example is shown.
[Drawing 17]The hydraulic-circuit figure of the gearbox in which the feeding-pressure-oil state at the time of the 1st speed is shown.

[Drawing 18]The hydraulic-circuit figure of the gearbox in which the feeding-pressure-oil state at the time of the 2nd speed is shown.
[Drawing 19]The figure showing the temporal change of the size of an insertion shock.
[Drawing 20]The procedure figure showing the speed change control method of the first working example.
[Drawing 21]The mimetic diagram showing the situation of gear change by the speed change control method of the second working example.
[Drawing 22]The mimetic diagram showing the situation of gear change by the speed change control method of the third working example.
[Drawing 23]The skeleton figure of the conventional gearbox which comprises an epicyclic gear and a one-way clutch.
[Drawing 24]The layout pattern of the gear sequence of the conventional gearbox which comprises an epicyclic gear and a one-way clutch.
[Drawing 25]The skeleton figure of the conventional gearbox which comprises a parallel train of gears.
[Drawing 26]The layout pattern of the gear sequence of the conventional gearbox which comprises a parallel train of gears.
[Drawing 27]The layout pattern of the gear sequence of the conventional gearbox in which signs that a radial load is applied are shown.
[Description of Notations]
1 Motor
3, 5, 6, 7, 8, 9, and 10 Gearbox
12 Speed change control method
20 Marine gear
21 Drive device
22 Lubricating oil passage
32 1st speed clutch shaft mechanism
32a and 34a clutch shaft
34 2nd speed clutch shaft mechanism
37 Input shaft
38 Output shaft
39 Hydraulic pump
43 One-way clutch
44 Hydraulic clutch
50 Hydraulic circuit
51 Sequence valve
52 Solenoid operated directional control valve

[Translation done.]

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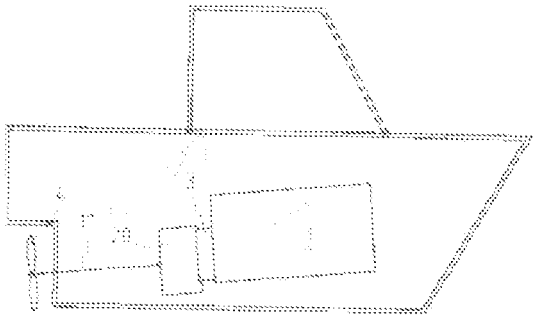
DRAWINGS

[Drawing 1]



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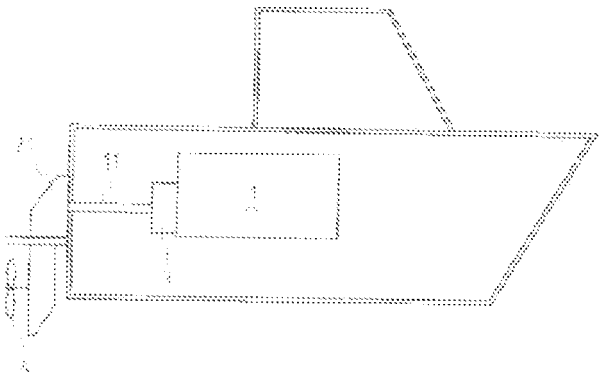

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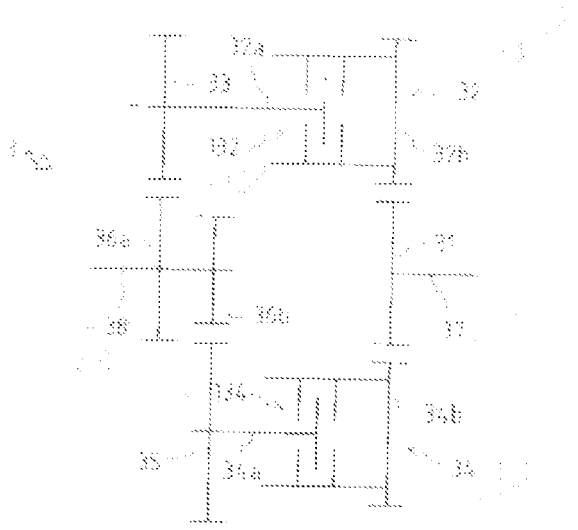

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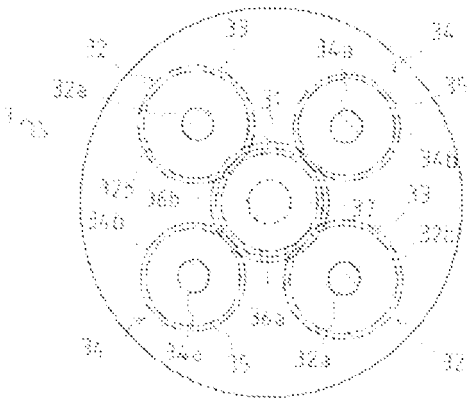

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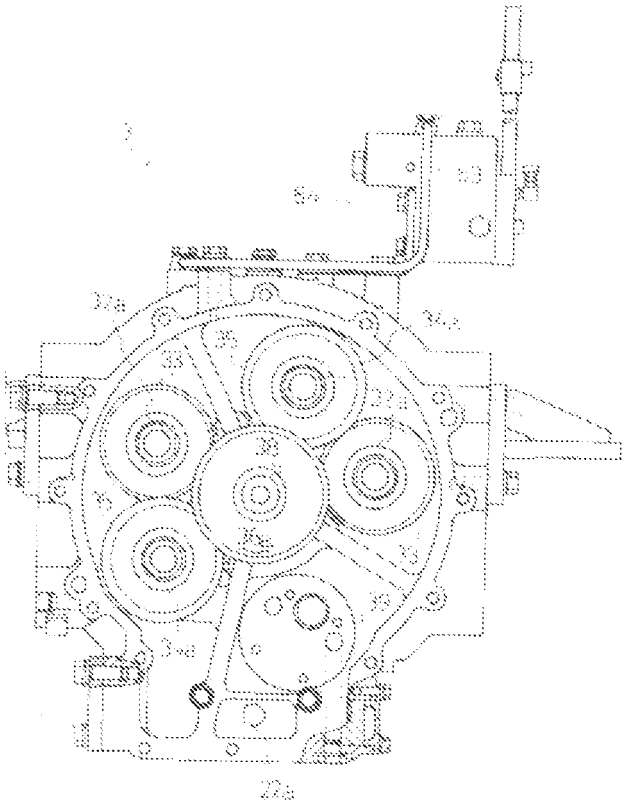

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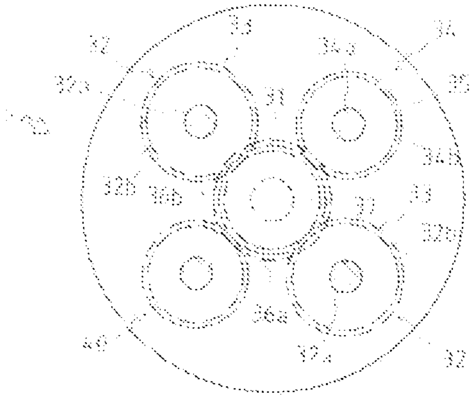

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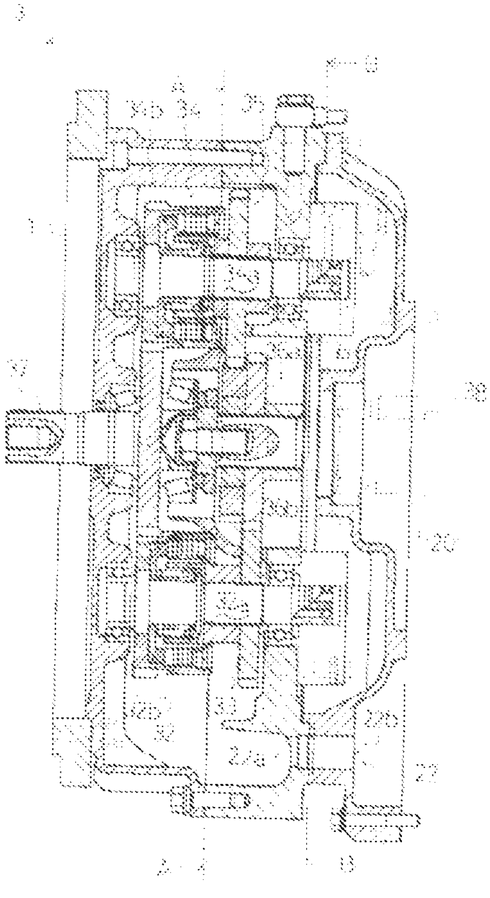

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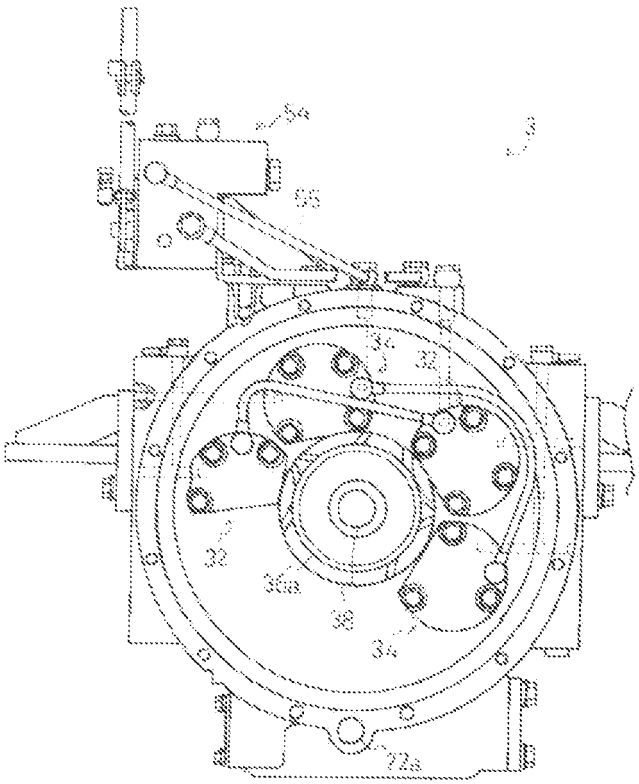

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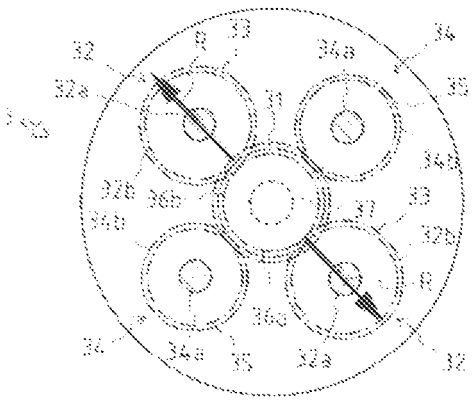

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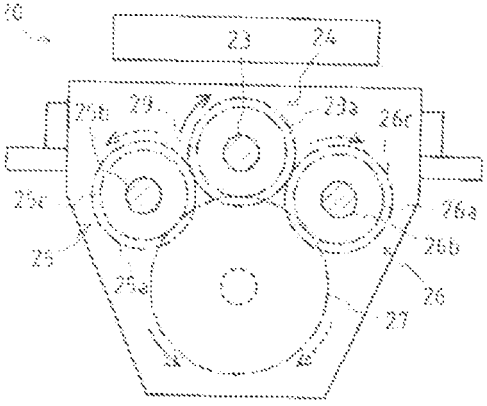

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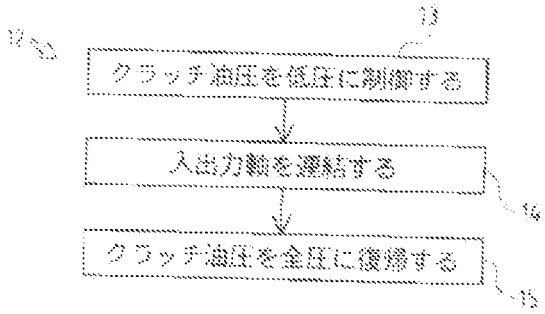

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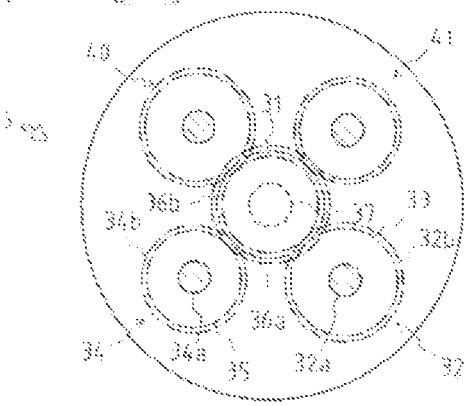

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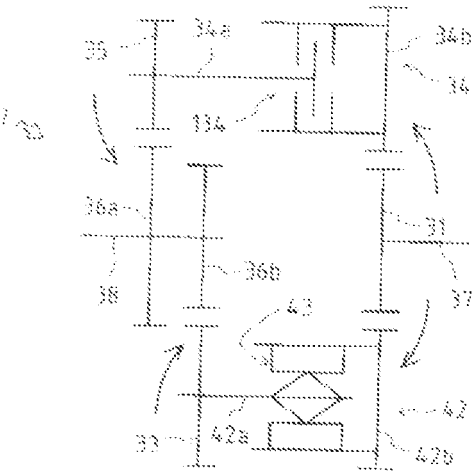
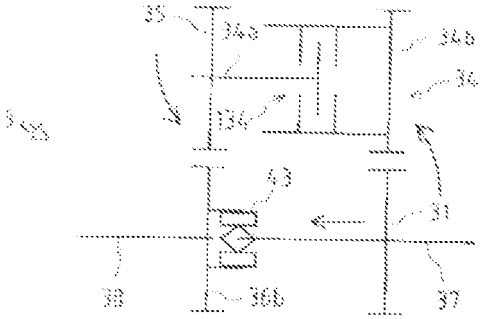
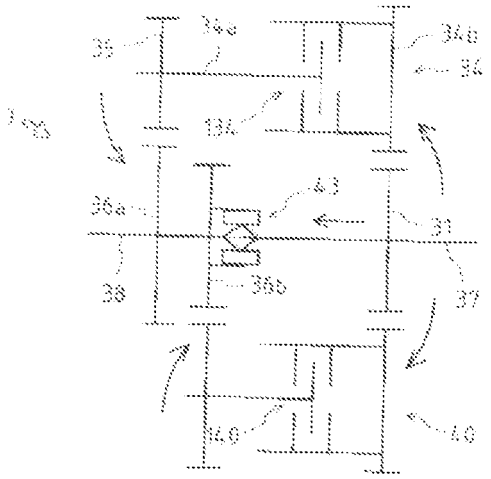


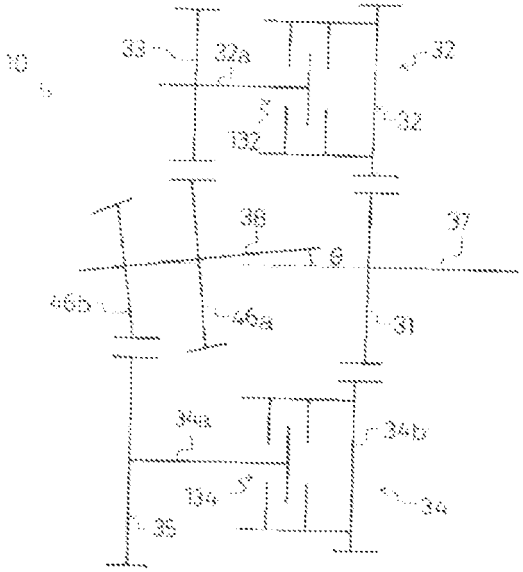
[Drawing 13]



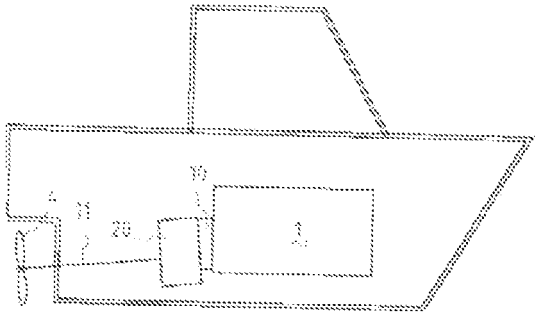
[Drawing 14]



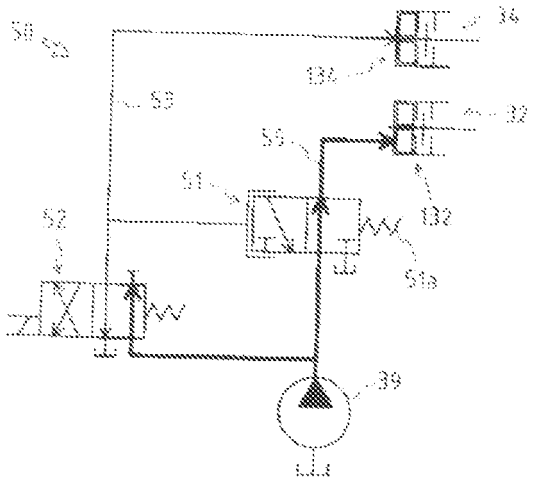
[Drawing 15]



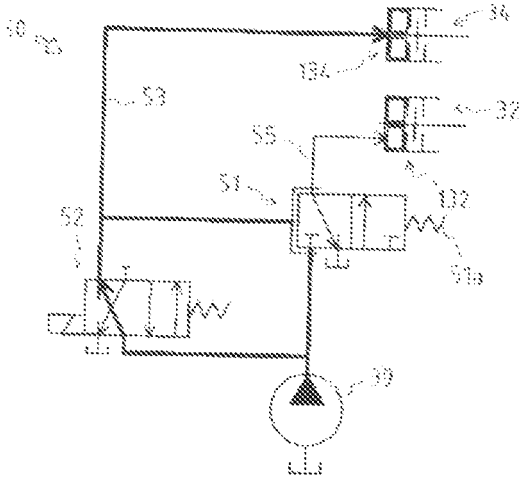
[Drawing 16]



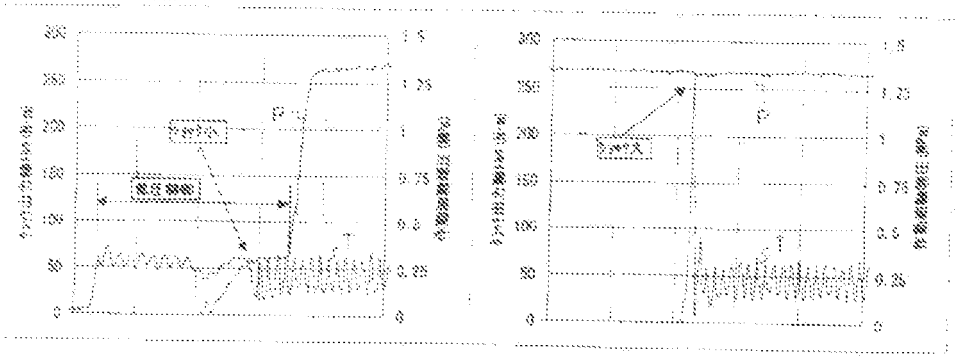
[Drawing 17]



[Drawing 18]

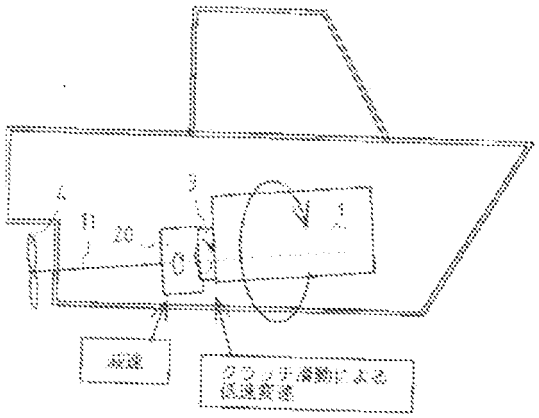


[Drawing 19]

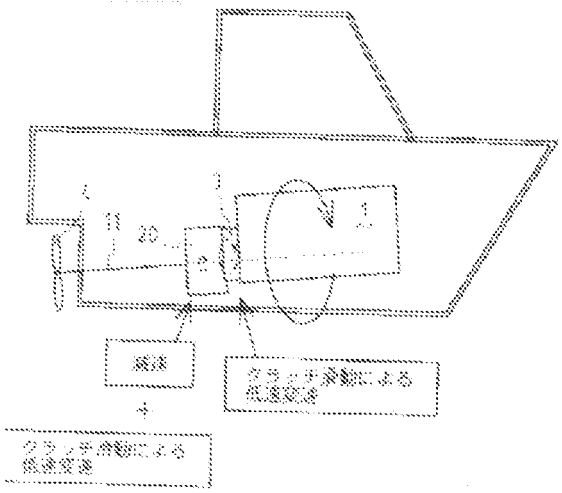


(a) (b)

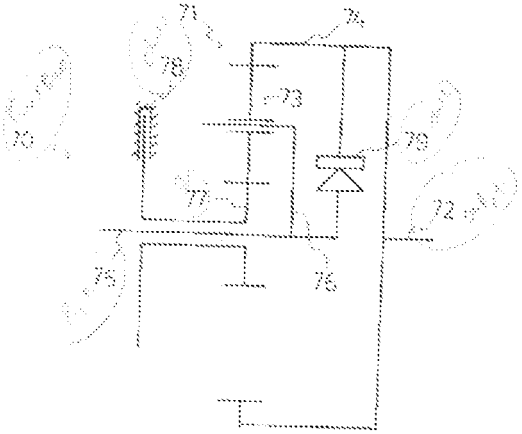
[Drawing 21]



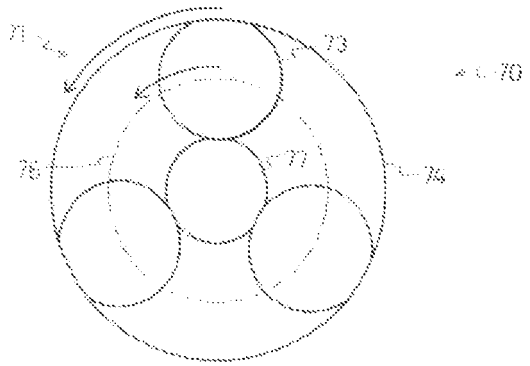
[Drawing 22]



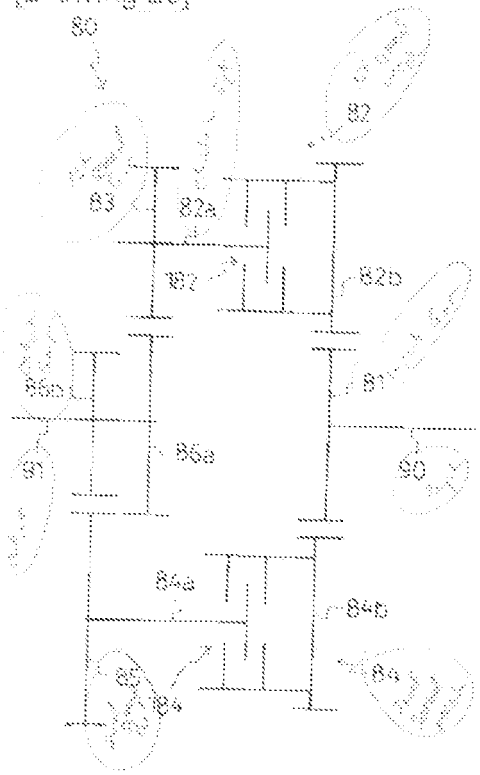
[Drawing 23]



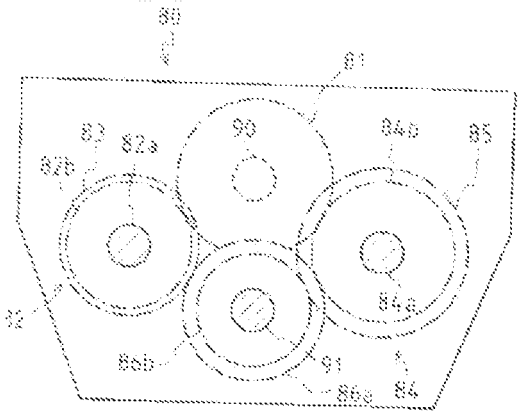
[Drawing 24]



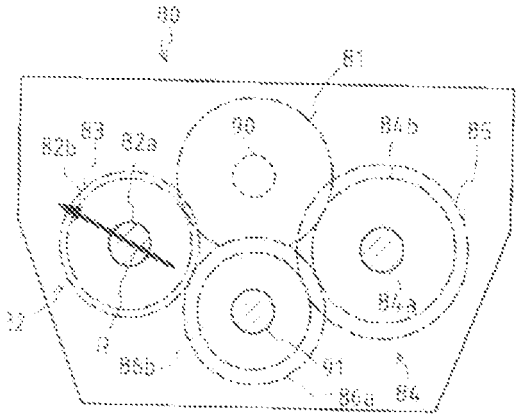
[Drawing 25]



[Drawing 26]



[Drawing 27]



[Translation done.]